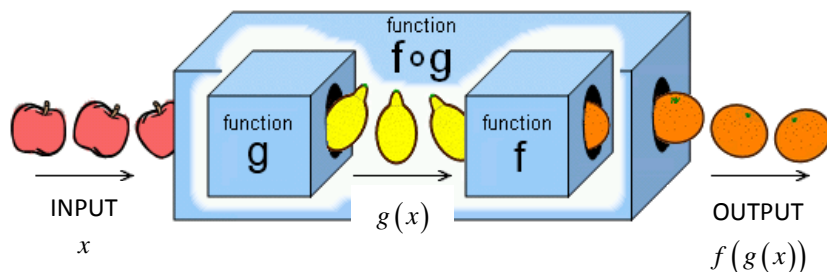


Composite Functions

Composite Function: In a composite function, one function is performed, and then a second function is performed on the result of the first function. $(f \circ g)(x) = f(g(x))$ and $(g \circ f)(x) = g(f(x))$.



Hints:

- Work inside out. Plug the input into the inside function, then plug the result into the outside function.
- $(f \circ g)(x) = f(g(x))$ is not the same as $(f \cdot g)(x) = f(x) \cdot g(x)$.

↑
Composition of functions

↑
Multiplication of functions

Example: Evaluate each expression using the values given in the table.

x	-3	-2	-1	0	1	2	3
f(x)	-7	-5	-3	-1	3	5	7
g(x)	8	3	0	-1	0	3	8

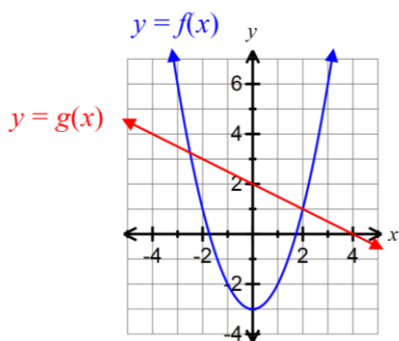
a) $(f \circ g)(-2)$

b) $(g \circ f)(-1)$

c) $(f \circ f)(1)$

d) $(g \circ g)(0)$

Example: Evaluate each expression using the graph.



a) $(f \circ g)(4)$

b) $(g \circ f)(-1)$

c) $(f \circ f)(1)$

d) $(g \circ g)(0)$

Example: $f(x) = 2x^2$ and $g(x) = 1 - 3x^2$

a) Find $(f \circ g)(4)$

b) Find $(g \circ f)(2)$

c) Find $(f \circ f)(1)$

d) Find $(g \circ g)(0)$

Domain of a Composite Function

The domain of $f \circ g$ is the set of all numbers x in the domain of g such that $g(x)$ is in the domain of f .

Example: Find the domain of the composite function $f \circ g$.

a) $f(x) = \frac{5}{x+4}$, $g(x) = \frac{8}{x}$

b) $f(x) = \frac{x}{x-1}$, $g(x) = \frac{x+5}{x-4}$

Example: $f(x) = x+1$ and $g(x) = x^2 + 4$

a) Find $(f \circ g)(x)$ and its domain.

b) Find $(g \circ f)(x)$ and its domain.

Example: $f(x) = \frac{1}{x+3}$ and $g(x) = -\frac{2}{x}$

a) Find $(f \circ g)(x)$ and its domain.

b) Find $(g \circ f)(x)$ and its domain.

c) Find $(f \circ f)(x)$ and its domain.

d) Find $(g \circ g)(x)$ and its domain.

Example: Show that $(f \circ g)(x) = (g \circ f)(x) = x$.

a) $f(x) = 4x$; $g(x) = x/4$

b) $f(x) = 4 - 3x$; $g(x) = \frac{1}{3}(4 - x)$

Example: Find functions f and g such that $f \circ g = H$.

a) $H(x) = (x^2 + 1)^4$

b) $H(x) = |2x + 1|$